PROPOSED REMEDIAL ACTION PLAN
South Troy Industrial Park
Environmental Restoration Project
City of Troy, Rensselaer County, New York
Site No. B00163-4

February 2006

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

A 1996 Clean Water/Clean Air Bond Act
Environmental Restoration Project

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SECTION 1: SUMMARY AND PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), is proposing a remedy for the South Troy Industrial Park. The presence of hazardous substances has created threats to human health and/or the environment that are addressed by this proposed remedy.

The 1996 Clean Water/ Clean Air Bond Act provides funding to municipalities for the investigation and cleanup of brownfields. Brownfields are abandoned, idled or under-used properties where redevelopment is complicated by real or perceived environmental contamination. They typically are former industrial or commercial properties where operations may have resulted in environmental contamination. Brownfields often pose not only environmental, but legal and financial burdens on communities. Under the Environmental Restoration Program, the State provides grants to municipalities to reimburse up to 90 percent of eligible costs for site investigation and remediation activities. Once remediated, the property can then be reused.

As more fully described in Sections 3 and 5 of this document, historical iron and steel production, petroleum releases and illegal dumping have resulted in the disposal of hazardous substances, including metals, polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs). These hazardous substances have contaminated the soil, fill and groundwater at the site, and have resulted in:

- a threat to human health associated with potential exposure to soil, fill, groundwater, and soil vapors,

- an environmental threat associated with the impacts of contaminants to groundwater.

To eliminate or mitigate these threats, the NYSDEC proposes the following remedy to allow for commercial, industrial and passive recreational use of the site. Passive recreational use includes golf courses, bike or walking paths, tennis courts, green space or other public uses with limited potential for soil contact.

- A remedial design program to provide the details necessary to implement the remedial program.

- Placement of a minimum 12-inch clean soil cover over the site. The soil cover would be underlain by a warning layer to identify the presence of potentially contaminated fill beneath it and to provide a physical barrier against unintended penetration.

- Treatment of soil and groundwater in the area of the site where a buried tank and drums were removed.

- Excavation and off-site disposal of abandoned petroleum pipelines that cross a portion of the site. The pipes would be capped at the ends where they enter the site.

- Development of a site management plan to address residual contamination and any use restrictions. The site management plan would also require an evaluation of the potential for vapor intrusion in any buildings to be developed on the site.

- Imposition of an environmental easement.

- Periodic certification of the institutional and engineering controls.

- Long term groundwater monitoring

The proposed remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria and guidance are hereafter called SCGs.

This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments received during the public comment period.

The NYSDEC has issued this PRAP as a component of the Citizen Participation Plan developed pursuant to the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375. This document is a summary of the information that can be found in greater detail in the February 2006 "Remedial Investigation Report" (RI), the February 2006 Alternatives Analysis (AA) Report", and other relevant documents. The public is encouraged to review the project documents, which are available at the following repositories:

Troy Public Library
100 Second Street
Troy, NY 12180
Mon - Thurs: 10 AM - 8 PM
Fri & Sat: 9 AM - 5 PM
Phone: (518) 274-7071

Rensselaer County
Dept. Economic Planning and Development
1600 7th Avenue, 5th Floor
Troy, NY 12180
Attention: Dan Pollay
Monday - Friday: 9:00 - 5:00
Phone: (518) 270-2917

NYSDEC Albany Office
625 Broadway, 12th Floor
Albany, NY 12233-7013
Attention: George Heitzman
Monday - Friday: 8:00 - 4:00
Phone: (518) 402-9818

The NYSDEC seeks input from the community on all PRAPs. A public comment period has been set from February 10, 2006 to March 27, 2006 to provide an opportunity for public participation in the remedy selection process. A public meeting is scheduled for February 28, 2006 at the Rensselaer County Office Building beginning at 7:00 pm.

At the meeting, the results of the RI/AAR will be presented, along with a summary of the proposed remedy. After the presentation, a question-and-answer period will be held, during which verbal or written comments may be submitted on the PRAP. Written comments may also be sent to Mr. Heitzman at the above address through March 27, 2006.

The NYSDEC may modify the proposed remedy or select another of the alternatives presented in this PRAP, based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

Comments will be summarized and addressed in the responsiveness summary section of the Record of Decision (ROD). The ROD is the NYSDEC's final selection of the remedy for this site.

SECTION 2: SITE LOCATION AND DESCRIPTION

The South Troy Industrial Park comprises three separate parcels of undeveloped land located along East Industrial Parkway in the City of Troy, Rensselaer County (see Figures 1 and 2). These parcels are generally bounded to the east by the Conrail railroad tracks and to the west by the Hudson River. The combined acreage of these parcels is 20.98 acres, of which Parcel 1, the northernmost parcel, comprises 16.96 acres. The site is owned by the Rensselaer County Industrial Development Agency (IDA).

Land use in this area is industrial and institutional, with residential properties and an elementary school on the opposite side of the railroad tracks. Properties adjoining the three parcels include Troy Slag Products, New Penn Trucking, Capital Cleaners, the Hudson-Mohawk Industrial Gateway Museum, the Rensselaer County Jail, the City of Troy Department of Public Works, Callanan Industries and the former Sperry Warehouse. The New Penn Trucking facility, which is adjacent to Parcel 1, was the subject of a completed remediation under the DEC's Voluntary Cleanup Program. The site is approximately one-half mile north of the Niagara Mohawk Water Street site, a former manufactured gas plant site where remediation activities have also been performed.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The site was used as farmland until 1862, when it began to be developed as the Lower Works of the Burden Iron Works. The site was originally a low-lying element of the Hudson River flood plain, and was filled with iron manufacturing wastes to raise its elevation. These wastes included slag, ash and cinders, as well as rubble from building demolition and structure fires in the City of Troy. The depth of this fill ranges from 2 feet in eastern portions of the site, to 30 feet along the Hudson River.

Historical documents indicate that Parcel 1 was used primarily for waste slag and ash disposal, along with the storage of iron ore and coal offloaded from barges. Parcel 2 primarily contained the rolling mill, but also at least one small gas producer house, which may be associated with manufactured gas plant wastes. A second small gas producer house was historically present along the boundary of Parcel 2 and the former Sperry Warehouse. Beginning in the 1920's, iron production was phased out, and the Republic Steel Corporation began to operate the blast furnaces at the Lower Works. Republic Steel eventually acquired the site in 1940, and continued steel manufacturing until 1972.

The northeast corner of Parcel 2 is also crossed by three petroleum supply pipelines that historically delivered fuel oil from an off-site barge offloading facility to storage tanks at the adjacent property ("the Alamo"). These pipes are exposed to view in a concrete valve pit. Based on the steam jackets surrounding the pipes and anecdotal evidence, the pipelines are believed to have carried #6 fuel oil.

3.2: Remedial History

Several investigations have been conducted at the site and neighboring properties since 1986. In 1986 a subsurface investigation was conducted to characterize geotechnical and environmental conditions beneath the site. Seventeen test borings were performed, and ten of these were converted to groundwater monitoring wells. Metals were found to exceed their cleanup guidelines in 2 of the wells.

In 1990 an Environmental Site Assessment was performed at the site. Four test borings, seven monitoring wells, and 35 test pits were performed at several parcels along East Industrial Parkway, including this site, and the adjacent Rensselaer County Jail and New Penn Trucking facility. During this investigation, low levels of benzene were detected on Parcel 2 and elsewhere, and field evidence of petroleum contamination was found.

Between 1999 and 2002 several investigations were performed at the New Penn Trucking facility adjacent to Parcel 1 of this site. An area of coal tar was discovered beneath the proposed building footprint which was excavated and removed from that site.

In 2002, a total of 32 test pits were performed as part of two separate investigations on the portion of Parcel 1 between New Penn Trucking and the Rensselaer County Jail to visually and chemically characterize the underlying soil and fill material. Certain metals and semivolatile organic contaminants were detected above their cleanup guidelines, but coal tar was not encountered.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past owners and operators, waste generators, and haulers.

Since no viable PRPs have been identified, there are currently no ongoing enforcement actions. However, legal action may be initiated at a future date by the State to recover State response costs should PRPs be identified. The Rensselaer County IDA will assist the State in their efforts by providing all information to the state which identifies PRPs. The Rensselaer County IDA will also not enter into any agreement regarding response costs without the approval of the NYSDEC.

SECTION 5: SITE CONTAMINATION

The Rensselaer County IDA has recently completed a Remedial Investigation/Alternatives Analysis Report (RI/AAR) to determine the nature and extent of contamination by hazardous substances at this environmental restoration project site.

5.1: Summary of the Site Investigation

The purpose of the RI was to define the nature and extent of contamination resulting from previous activities at the site. The RI was conducted between August 2004 and October 2005. The field activities and findings of the investigation are described in the RI report.

The following activities were conducted during the RI:

- Compilation of previous sampling data;
- Excavation of seven test trenches and four test pits to characterize the nature of site fill, determine its depth profile and investigate potential source areas;
- Collection of 21 surface soil samples to evaluate the potential for human exposures;
- Installation of 28 soil borings and 13 monitoring wells for analysis of soils and groundwater as well as physical properties of soil and hydrogeologic conditions; and
- Sampling of 24 new and existing monitoring wells.

To determine whether the soil and groundwater contain contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on NYSDEC "Ambient Water Quality Standards and

Guidance Values” and Part 5 of the New York State Sanitary Code.

- Soil SCGs are based on the NYSDEC “Technical and Administrative Guidance Memorandum (TAGM) 4046; Determination of Soil Cleanup Objectives and Cleanup Levels".

- Background surface soil samples were taken from three locations. These locations were upgradient of the site, and were unaffected by historic or current site operations. The samples were analyzed for metals and semivolatile organic compounds (SVOCs).

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized below. More complete information can be found in the RI report.

5.1.1: Site Geology and Hydrogeology

Surficial geology in the vicinity of the site is mapped as recent alluvium deposits, consisting of fine sand to gravel, which is generally confined to floodplains within a valley. In larger valleys, the sand and gravel may be overlain by silt. Based on the findings of the RI, native soils beneath overlying fill materials consist primarily of silts with varying percentages of sand and clay over sand and gravel.

Bedrock in the vicinity of the site is mapped in the category of the Trenton Group, consisting of shale and minor mudstone and sandstone. Bedrock was not encountered during subsurface investigations conducted of the site as part of this RI. However shale bedrock was encountered during previous site investigations at depths ranging from 35 feet to 58.5 feet below ground surface.

The site is covered with fill materials to varying depths, as shown on the contour map presented in Figure 3. Under Parcel 1, native soils were encountered beneath the fill materials at depths ranging from 8 feet along the eastern boundary to 32 feet along the Hudson River. These soils are composed primarily of brown and gray silts. Groundwater was encountered during the investigation at the fill/native soil interface. Overall, the surface topography of native soils underlying Parcel 1 slopes westerly towards the Hudson River. A large pile of slag is present in the northwest corner of Parcel 1, extending off-site onto the adjacent property to the north. This 50-foot tall pile of slag is commonly referred to as “Slag Mountain”, as indicated on Figure 2. The northern and eastern faces of Slag Mountain are nearly vertical as the result of past excavation of the slag for use in road construction.

In the portion of Parcel 1 east of East Industrial Parkway, a sand and gravel water bearing unit was encountered beneath the native silt layer at certain locations. Groundwater encountered above the silt layer is referred to as shallow groundwater while groundwater encountered in the underlying sand and gravel layer is referred to as deep groundwater.

Beneath Parcel 2 the fill material extends in depth from 4 to 16 feet below ground surface (see Figure 3). The fill material consists primarily of ash, cinder, sand, gravel, and a lesser degree of slag than was found on Parcel 1. Slag was found beneath the portions of Parcel 2 closest to the Hudson River. Native soils underlying the fill material are comprised predominantly of silts, with varying percentages of clay, overlying sand and gravel deposits. Shallow groundwater was encountered above the silt layer, while deep groundwater was encountered within a sand and gravel layer beneath the silt layer. As depicted on Figure 3, the thickness of fill increases in the central portions of Parcel 2 and forms a trough-like feature within the silt layer. Subsurface foundation and vault structures were observed during the investigation of the Parcel.

Beneath Parcel 3 the subsurface profile consists of fill material (silt, sand, cinder and slag) that ranges in depth from approximately 6 to 8 feet below ground surface. The underlying native soils consist of silts with small percentages of clay.

The water table beneath the entire site ranged in depth from approximately 4 to 19 feet below ground surface in the shallow, unconfined aquifer, and from approximately 20 to 33 feet below ground surface for the deep, semi-confined aquifer located in the sand and gravel below the silt unit.

Generally, groundwater flows in a westerly direction towards the Hudson River. However, north of Parcel 2, isolated groundwater flows to the southwest and northwest were observed. Also, shallow groundwater flow beneath Parcel 2 appears to follow the topography of the silt layer and converges in a narrow trough area on the central portion of the parcel (see Figure 4). Deep groundwater flow beneath Parcel 2 is towards the northwest, where it eventually changes direction and proceeds in a westerly direction towards the Hudson River.

Water levels in monitoring wells located near the Hudson River were observed to change with tidal fluctuations in the river. Monitoring wells located on the southern and eastern portions of Parcel 1, further away from the Hudson River, showed a lesser degree of tidal influence.

5.1.2: <u>Nature of Contamination</u>

As described in the RI report, many soil and groundwater samples were collected to characterize the nature and extent of contamination. As summarized in Tables 1a through 1c, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and inorganics (metals).

The VOCs of concern are acetone, methyl t–butyl ether (MTBE), benzene, toluene, xylenes, and isopropyl benzene. Acetone is a component of paint thinner and other solvents, and the remainder are components of gasoline. These were found in a buried tank and buried drums that were discovered during the investigation and subsequently removed from the site, as described in Section 5.2. However these contaminants remain in soil and groundwater beneath the disposal area.

The SVOCs of concern in soil and fill are polycyclic aromatic hydrocarbons (PAHs), such as benzo(a)pyrene, chrysene, and benzo(a)anthracene. These PAHs are commonly associated with coal, ash, heavy petroleum oils and products of incomplete combustion. Seven of these compounds are known or suspected human carcinogens. These contaminants have low volatility and low solubility in water, and are typically transported in the solid phase as dust or particles in groundwater.

The inorganic contaminants of concern include the metals arsenic, beryllium, iron, cadmium, chromium, copper, manganese, mercury, nickel, selenium and zinc. These were found throughout the surface and subsurface fill, and are commonly associated with the historical disposal of slag from iron and steel production at the site.

5.1.3: <u>Extent of Contamination</u>

This section describes the findings of the investigation for all environmental media that were investigated. Because the site is comprised of three discontiguous parcels with somewhat different contamination characteristics, the extent of contamination is described separately for each parcel. As discussed below, "subsurface soil" includes fill material - the slag and other materials that were historically used for fill - and the native soil that lies beneath the fill material. In many locations, the fill material also contains interbedded layers of native soil, which may have been used as intermediate cover during filling.

Chemical concentrations are reported in parts per billion (ppb) for water, parts per million (ppm) for fill materials and soil. For comparison purposes, where applicable, SCGs are provided for each medium.

Tables 1a through 1c summarize the degree of contamination for the contaminants of concern in soil, fill and groundwater and compares the data with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

PARCEL 1

Surface Soil (0-2 inches)

Surface soil collected from several locations on Parcel 1 was found to contain PAHs at levels that exceed their SCGs. The highest levels were found at locations in the eastern portion of the parcel, near the railroad tracks. One of these locations also contained the highest levels of several metals listed in Table 1, including cadmium, chromium, copper, mercury, nickel, selenium, and zinc.

Samples across the parcel contained elevated levels of arsenic, beryllium, copper, iron, selenium and zinc. Based on very high levels of iron in these samples, these metals are likely associated with slag.

Subsurface Soil

Subsurface soil beneath Parcel 1 generally contains the same distribution and level of contaminants as surface soils, with frequent detections of benzo(a)pyrene, arsenic, beryllium, iron, nickel, selenium and zinc above cleanup guidelines. As shown on Figure 3, the depth of fill ranges from 8 feet along the eastern portion of the site to 32 feet along the Hudson River shoreline. The estimated volume of fill material beneath Parcel 1 is 603,000 cubic yards.

Groundwater

A limited area of groundwater contamination is present in the northeast corner of Parcel 1, where the tank and drums were removed. Levels of benzene (17 ppb), toluene (110 ppb), ethylbenzene (110 ppb) and xylenes (430 ppb) exceed their groundwater quality standards (1 ppb, 5 ppb, 5 ppb, and 5 ppb, respectively). This area of groundwater contamination extends approximately 50 feet from the source area that was removed as described in Section 5.2.

Groundwater beneath the remainder of Parcel 1 exceeds ambient water quality standards for the inorganic compounds iron, manganese and selenium. Iron and manganese exceedances were significant, with maximum detections of 3,690 ppb and 3,670 ppb, compared to their 300 ppb standard. Selenium detections were minor, with a maximum concentration of 13.9 ppb, compared to its standard of 10 ppb.

PARCEL 2

Surface Soil (0-2 inches)

The highest levels of SVOCs in surface soil were found in sample SS-17, which is located in the eastern portion of Parcel 2, approximately 50 feet west of the exposed petroleum pipeline pipe pit. Although surface soil in this area did not show visual evidence of petroleum contamination, the analytical results indicate that surface soil has been impacted. Levels of benzo(a)anthracene (11 ppm), chrysene (11 ppm), benzo(b)fluoranthene (14 ppm) and benzo(a)pyrene (8.8 ppm) were the highest detected on any of the three parcels.

Subsurface Soil

Subsurface fill material beneath Parcel 2 ranges from 4 to 16 feet thick, and contains similar levels of the contaminants found throughout the site. The estimated volume of fill material beneath Parcel 2 is 64,400 cubic yards. Test pits and soil borings near and next to the abandoned petroleum pipeline did not reveal any evidence of petroleum contamination.

Groundwater

One well on Parcel 2 contained benzene, ethyl benzene and isopropyl benzene at 23 ppb, 15 ppb, and 6.6 ppb, respectively, compared to their groundwater quality standards of 1 ppb, 5 ppb and 5 ppb respectively. This location is downgradient of the former Sperry Warehouse, which has been identified as a potential source of petroleum contamination. A different well, located along Main Street, contained 18 ppb of methylene chloride, compared to its standard of 5 ppb. This compound was not found in any other wells at the site, and the source is unknown.

Groundwater beneath Parcel 2 contained high levels of iron and manganese in nearly all of the samples collected. Maximum levels of iron and manganese were 21,700 ppb and 734 ppb, compared to their water quality standard of 300 ppb.

PARCEL 3

Surface Soil (0-2 inches)

The surface soil sample collected from Parcel 3 contained slightly elevated concentrations of PAHs and metals. Levels of both metals and PAHs were generally lower than in surface soils collected from the other two parcels.

Subsurface Soil

Fill material on Parcel 3 ranges from 6 to 8 feet thick beneath this parcel. The sample of subsurface soil collected at this location did not contain any SVOCs above their respective cleanup guidelines. Only iron and manganese exceeded their cleanup guidelines, at levels of 2560 ppm and 1480 ppm, respectively.

Groundwater

Groundwater beneath Parcel 3 contained elevated levels of iron and manganese. No VOCs or SVOCs were detected above their respective ambient quality standards.

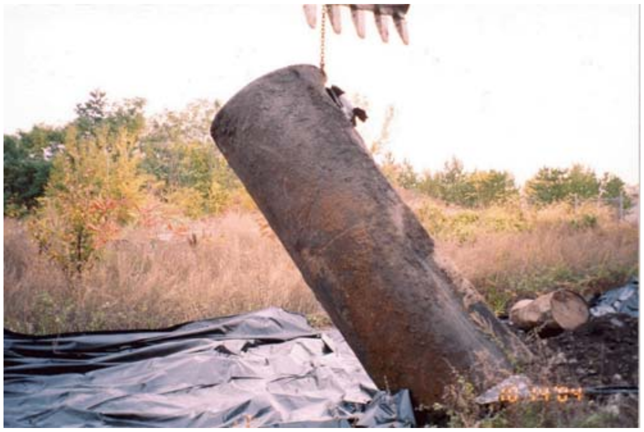
5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS.

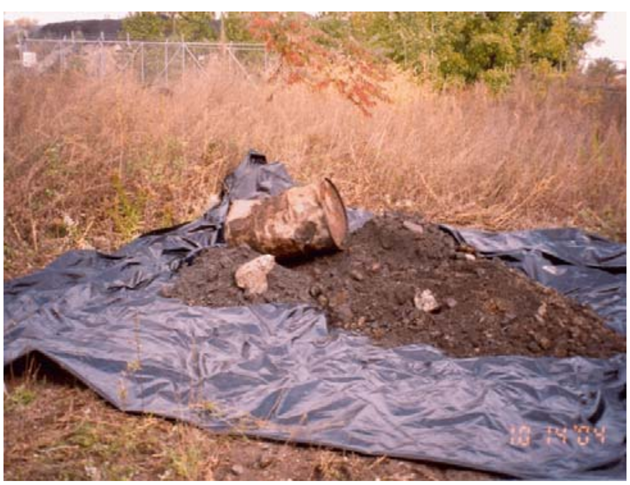
In October 2004, a driller working in the northeast corner of Parcel 1 reported that he had encountered a possible buried vessel containing a thick black material with a paint-like odor. This location is shown on Figure 2. Drilling activity in this area was suspended, and the IDA mobilized excavation equipment to uncover and remove the vessel. When the excavation was opened, two 55-gallon drums and one 1000-gallon tank were found, buried at a depth of approximately 12 feet below grade. The two drums were placed into overpack containers and tested for proper off-site disposal. The contents of the buried tank were pumped out, after which the tank was cleaned and removed from the ground.

Buried Drum and Tank

Analysis of the liquid contents of the excavated tank revealed the presence of toluene, methylene chloride, methyl t-butyl ether (MTBE), phenol and methylphenols. These compounds are consistent with a mixture of waste gasoline and methylene chloride. The contents of one of the 55-gallon drums was found to be an ignitable hazardous waste containing several gasoline-related compounds such as benzene, toluene, ethyl benzene and xylenes (BTEX). The second 55-gallon drum contained a tarry substance that contained many semivolatile organic compounds (SVOCs).


Excavation of the Buried Tank


Overpack of the Excavated Drum


Temporary Staging of Contaminated Soil

Grossly contaminated soil in the immediate vicinity of the buried tank and drums was removed and temporarily staged on a polyethylene sheet. An attempt was made to excavate all contaminated soil from the disposal area. However, based on field meter readings, the extent of contamination proved to be too extensive to excavate. As a result, the staged contaminated soil was placed back in the excavation and re-covered, to be addressed as part of the comprehensive site remedy. A sheet of polyethylene was placed over the contaminated backfill, at approximately 10 feet below ground surface, to separate clean soil from contaminated soil and to enhance a possible soil vapor extraction system (see Section 7.1). Two groundwater monitoring wells were installed in the backfilled area, and a supplemental investigation was later conducted in this area to fully delineate the extent of contamination, as described in Section 5.1.

5.3: <u>Summary of Human Exposure Pathways</u>:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 6.1 of the RI report.

An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

Potential pathways of exposure to site contaminants are discussed below:

Surface Soil

Dermal contact, ingestion and inhalation of surface soil contaminated with metals and SVOCs is a potential exposure pathway for site trespassers, site visitors and future site workers. The potential also exists for off-site residents to contact, ingest or inhale contaminated surface soil from the off-site migration of dust or from the deposition of site-related contaminants by stormwater runoff.

The proposed remedy would further reduce the potential for future exposures to surface soil contaminants through the placement of a barrier to contact (clean soil cover/vegetation or pavement). The remedy would also include institutional controls which would require that any on-site excavations be performed under a site management plan which would address potential worker/community contact with surface soil contamination.

Subsurface Soil

There are currently no completed exposure pathways for subsurface soil and fill. Direct contact, ingestion or inhalation of subsurface soil contaminated with VOCs, SVOCs and metals are potential exposure pathways for future site workers who may contact subsurface soil during future remedial or construction work. Site visitors, trespassers and nearby community residents could potentially be exposed to contaminants in subsurface soil through the inhalation of dusts generated during future site excavation/construction work.

The proposed remedy would minimize potential exposures through the development of a site management plan, environmental easements, and maintenance of the soil or asphalt cover.

Groundwater

Ingestion, direct contact or inhalation of groundwater containing VOCs, SVOCs and metals is a potential exposure pathway at this site.

The site and surrounding area are served by public water; therefore, exposure to groundwater contaminants via ingestion, direct contact or inhalation is unlikely. Under the proposed remedy, the site would continue to be managed as a commercial/industrial site and institutional controls (e.g. environmental easements) would be imposed to mitigate future exposure pathways. This would include a groundwater use restriction to prevent the use of groundwater as a potable water source without treatment as determined by the NYSDOH. Additionally, the proposed remedy includes the remediation of groundwater contamination in the portion of Parcel 1 where the buried tank and drums were removed. This action would further minimize future exposure pathways as the groundwater contaminant source area on this parcel would be removed.

Soil Vapor

Volatile chemicals in subsurface soil or groundwater can be a source for soil vapor contamination and can potentially affect the indoor air quality of future on-site structures through the process of vapor intrusion.

The proposed remedy includes implementation of a site management plan which would require an evaluation of the potential for vapor intrusion in any buildings to be developed on the site.

5.4: Summary of Environmental Impacts

This section summarizes the existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

The Fish and Wildlife Impact Analysis, which is Exhibit 4 of the RI report, presents a detailed evaluation of the habitats present at the site and the potential impacts to fish and wildlife receptors. The evaluation indicates that the habitat value of the site is low due to its historical industrial use and extensive placement of fill. The RI indicates that contaminants present at the site are unlikely to migrate into the adjacent Hudson River.

In a portion of the site where soluble contaminants are present, site contamination has impacted the groundwater resource of the shallow water bearing unit.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS AND THE PROPOSED USE OF THE SITE

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous substances disposed at the site through the proper application of scientific and engineering principles.

The proposed future use for the South Troy Industrial Park is commercial and industrial. A corridor along the western edge of Parcel 1, adjacent to the Hudson River may also be used for passive recreational purposes (i.e., a bike path).

The remediation goals for this site are to eliminate or reduce to the extent practicable:

- exposures of persons at or around the site to metals and SVOCs in surface and subsurface soils and fill;
- the release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and
- the release of contaminants from soils or groundwater into indoor air of future overlying buildings through soil vapor intrusion.

Further, the remediation goals for the site include attaining to the extent practicable:

- ambient groundwater quality standards

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, and comply with other statutory requirements. Potential remedial alternatives for the South Troy Industrial Park Site were identified, screened and evaluated in the AA Report which is available at the document repositories identified in Section 1.

Because the site is comprised of three discontiguous parcels with somewhat different contaminant characteristics, the AA Report developed and evaluated alternatives separately for each parcel. The alternatives are numbered so the parcel number is followed by the alternative number for that parcel (e.g., 1-1, 1-2, 2-1, etc.)

A summary of the remedial alternatives that were considered for this site are discussed below. The present worth represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated soil and groundwater at the site.

PARCEL 1

Alternative 1-1: No Further Action

The No Further Action alternative recognizes remediation of the site conducted under the previously completed IRM. To evaluate the effectiveness of the remediation completed under the IRM; only continued monitoring would be necessary. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Present Worth: . . . . $ 30,735
Capital Cost: . . . . $ 0
Annual OM&M . . . . $ 5,750

Alternative 1-2: Institutional Controls

This alternative would also leave the site in its present condition, but would place an institutional control on the site to restrict future land use and notify future owners or prospective purchasers of the presence of contamination. This institutional control would be in the form of an environmental easement granted to the NYSDEC.

Present Worth: . . . . $ 23,000
Capital Cost: . . . . $ 5,000
Annual OM&M . . . . $ 1,200
Time to Implement . . . . 3 months

Alternative 1-3: Soil Cover and Institutional Controls

This alternative would place a soil cover system with a minimum depth of 12 inches over the parcel, which would be protected and maintained by implementation of a Site Management Plan and an associated institutional control. The soil cover system would consist, from bottom to top, of a demarcation layer; a barrier layer of clean soil at least 8 inches thick; and a 4-inch layer of clean soil capable of supporting vegetative growth. The demarcation layer would be a plastic geogrid material, such as orange snow fencing, to identify the presence of potentially contaminated fill beneath it and to provide a physical barrier against unintended penetration. The top layer of the soil cover would be seeded, except where development plans for the site specify pavement or concrete surfaces. If site development can be coordinated with remediation, the soil cover could be replaced by paved surfaces or building slabs.

In order to place a soil cover over the northwestern corner of the site, Slag Mountain would have to be taken down to create a stable slope. Because only a portion of the pile is present on the site, this alternative would involve the removal of the pile up to the property line, while leaving a stable slope on the adjacent property. This alternative assumes that the excavated slag would be crushed and spread on the site prior to capping. However, this material may also qualify for beneficial re-use in road construction or other structural fill.

The Site Management Plan developed under this alternative would specify the procedures necessary to maintain the site remedy and protect the future occupants of the site. These include provisions for managing contaminated soils that may be excavated from the site during future development activities. The plan would specify procedures for proper characterization, disposal and/or replacement of excavated material, and full repair of the soil cover system. The SMP would also require an evaluation of the potential for vapor intrusion in any buildings developed on the site. The plan would also specify the monitoring and maintenance requirements to ensure the long-term effectiveness of the remedy.

In addition to the elements of the institutional control listed in Alternative 1-2, the environmental easement granted to the NYSDEC would include enforceable provisions associated with the technical requirements of the Site Management Plan. These include identification of the barrier layer and demarcation layer, a requirement for compliance with the Site Management Plan, and a requirement for periodic certification that the remedy is effective. This easement would also serve to notify future owners and prospective purchasers of the technical elements of the remedy.

Groundwater would be monitored at the site to verify whether contaminant concentrations are stable. For cost estimating purposes, this alternative assumes that groundwater would be monitored annually for the first 5 years after construction, then every 5 years thereafter.

Present Worth: . . . . $ 2,084,000
Capital Cost: . . . . $ 1,940,000
Annual OM&M $13,150
Time to Implement . . . . 1 year

Alternative 1-4: Soil Cover, Groundwater Remediation, and Institutional Controls

In addition to the elements listed in Alternative 1-3, this alternative would provide for the treatment of residual soil and groundwater contamination in the portion of Parcel 1 where the buried tank and drums were removed. The AA Report identified three potential technologies for soil and groundwater treatment: multi-phase extraction; chemical oxidation; and air sparging/soil vapor extraction. These technologies are briefly described on the following page.

The AA Report concluded that multi-phase extraction would be the most effective technology to remediate soil and groundwater due to its lower cost, shortest time frame and equal effectiveness. As a result, pumping groundwater and vapors is evaluated as the representative technology in this alternative. However, if site conditions or remediation costs change during the design phase, one of the other technologies could be considered.

Present Worth: . . . . $ 2,298,000
Capital Cost: . . . . $ 2,154,000
Annual OM&M . . . . $ 13,150
Time to Implement . . . . 2 years

PARCEL 2

Alternative 2-1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Present Worth: . . . . $ 0
Capital Cost: . . . . $ 0
Annual OM&M . . . . $ 0

Alternative 2-2: Institutional Controls

As for Alternative 1-2, this alternative would leave Parcel 2 in its present condition, but would place an institutional control on the property to restrict future land use and notify future owners or prospective purchasers of the presence of contamination. This institutional control would be in the form of an environmental easement granted to the NYSDEC.

Present Worth: . . . . $ 14,000
Capital Cost: . . . . $ 5,000
Annual OM&M . . . . $ 600
Time to Implement . . . . 3 months

Alternative 2-3: Soil Cover, Piping Removal and Institutional Controls

This alternative would apply to Parcel 2 the same minimum 12-inch clean soil cover, Site

Remedial Technologies for Volatile Organic Contamination in Soil and Groundwater

Multi-Phase Extraction and Treatment

Multi-phase extraction involves the pumping of contaminated vapor and groundwater from beneath the site. Extraction wells are installed, groundwater is pumped, and a vacuum is applied to soils above the groundwater table. The extracted vapors and liquids are then treated prior to discharge to the atmosphere and sanitary sewer, respectively. The advantage of the multi-phase extraction system is that it lowers the groundwater table, creating newly unsaturated soils that can be treated by vapor extraction.

Soil Vapor Extraction and Air Sparging

Soil Vapor Extraction

Soil vapor extraction (SVE), also known as "soil venting" or "vacuum extraction", is a remedial technology that reduces concentrations of volatile contaminants adsorbed to soils above the groundwater table. In this technology, a vacuum is applied to wells near the source of soil contamination. Volatile contaminants evaporate, and the vapors are drawn toward the extraction wells. Extracted vapor is then treated as necessary, usually with carbon adsorption, before being released to the atmosphere. Although SVE does not fully remediate semivolatile contaminants, some reduction may occur due to the stimulation of biological activity as oxygen is delivered to the subsurface.

Air Sparging

Air sparging is a remedial technology that reduces concentrations of volatile contaminants that are adsorbed to soils below the water table and dissolved in groundwater. This technology involves the injection of clean air into groundwater, causing the contaminants to move from a dissolved state to the vapor phase. The air is then vented through the unsaturated zone. Air sparging is usually used together with SVE to treat both groundwater and soil, and to prevent the migration of vapors. This combined system, which consists of a series of air injection and vapor extraction wells, is called AS/SVE.

Chemical Oxidation

In-situ chemical oxidation is an in-place treatment technology that uses an oxidant such as peroxide or permanganate to destroy contaminants in both soil and groundwater. The oxidant would be injected through a series of wells into the subsurface, where it would migrate through the aquifer and break down contaminants that are amenable to oxidation. In-situ oxidation is effective for the VOCs of concern at this site, and would fully break down these contaminants without creating by-products of concern. This technology is not effective for treating many SVOCs or any metals. To determine the best oxidant and optimal injection rate for the specific contaminants and site conditions, a pilot study would be necessary.

Management Plan and institutional controls described in Alternative 1-3. However, it would also remove the portion of the fuel oil pipelines that lie beneath this parcel. The pipes would be cut at both ends where they enter the property and removed from the site. At the property line, the pipe ends would be sealed to prevent any material in the lines from leaking onto the site. Any residual petroleum in the pipes would be properly disposed, and any soil contamination discovered as the pipes are excavated would be excavated and removed.

Present Worth: $422,000
Capital Cost: . . . . $ 325,000
Annual OM&M . . . . $ 9,300
Time to Implement . . . . 1 year

PARCEL 3

Alternative 3-1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Present Worth: . . . . $ 0
Capital Cost: . . . . $ 0
Annual OM&M . . . . $ 0

Alternative 3-2: Institutional Controls

As for Alternatives 1-2 and 2-2, this alternative would leave Parcel 3 in its present condition, but would place an institutional control on the property to restrict future land use and notify future owners or prospective purchasers of the presence of contamination. This institutional control would be in the form of an environmental easement granted to the NYSDEC.

Present Worth: . . . . $ 10,000
Capital Cost: . . . . $ 5,000
Annual OM&M . . . . $ 330
Time to Implement . . . . 3 months

Alternative 3-3: Soil Cover and Institutional Controls

This alternative would apply to Parcel 3 the same minimum 12-inch clean soil cover, Site Management Plan and institutional controls described in Alternative 1-3.

Present Worth: $68,000
Capital Cost: . . . . $ 48,000
Annual OM&M . . . . $ 1,300
Time to Implement . . . . 1 year

Alternative 3-4: Excavation of Fill Material

Because Parcel 3 is much smaller than the other parcels, and because the thickness of fill material is less, full excavation of fill was retained as a feasible technology in the AA Report. An estimated 2,900 cubic yards of fill would be excavated and removed from the site, and the site would be backfilled with clean soil. Because all contamination would be removed from the site, no institutional controls would be necessary under this alternative.

Present Worth: . . . . $ 601,000
Capital Cost: . . . . $ 601,000
Annual OM&M . . . . $ 0
Time to Implement . . . . 1 year

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of environmental restoration projects in New York State. A detailed discussion of the evaluation criteria and comparative analysis is included in the AA Report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the NYSDEC has determined to be applicable on a case-specific basis.

The next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectivness. Capital costs and operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision. The costs for each alternative are presented in Table 1.

This final criterion is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/AAR reports and the PRAP are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which the NYSDEC will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PROPOSED REMEDY

The NYSDEC is proposing a remedy comprised of the following alternatives as the remedy for this site:

Parcel 1
1-4: Groundwater Remediation, Soil Cover and Institutional Controls

Parcel 2
2-3: Soil Cover, Piping Removal and Institutional Controls

Parcel 3
3-3: Soil Cover and Institutional Controls

The elements of this remedy are described at the end of this section and depicted in Figure 5. The proposed remedy is based on the results of the RI and the evaluation of alternatives presented in the AAR.

Alternatives 1-4, 2-3 and 3-3 are being proposed because they satisfy the threshold criteria and provide the best balance of the primary balancing criteria described in Section 7.2. They would achieve the remediation goals for the site by covering the soil and fill materials that pose a direct exposure threat to public health and the environment, and by creating the conditions needed to restore groundwater quality to the extent practicable. Residual soil and groundwater contamination in the IRM area would be remediated to ensure that potential vapor and groundwater exposures are eliminated.

Although groundwater beneath Parcel 2 is contaminated with low levels of petroleum-related compounds, the source of this contamination appears to be an adjacent parcel. Potential exposure to these contaminants would be addressed by the Site Management Plan's requirement that the potential for vapor intrusion be evaluated and mitigated as necessary for any new buildings constructed at the site. Removal of the former petroleum pipeline from Parcel 2 would ensure that if it contains any residual petroleum, it would pose no risk of future release. Removal of the pipes and access pit would also make the site more suitable for future development.

For Parcel 3, full excavation would pose significant short-term risks and would be difficult to implement. Concern for the railroad tracks adjacent to the property would likely require extensive structural protection and coordination with Conrail, causing extensive delays during the design phase. Because much of the waterfront area was filled with similar fill, the benefits of excavating fill from this parcel are small, and public health and the environment can be protected with a soil cover.

The estimated present worth cost to implement the remedy is $ 2,788,000. The cost to construct the remedy is estimated to be $ $2,527,000 and the estimated average annual operation, maintenance, and monitoring costs for 30 years is $ $23,750.

The elements of the proposed remedy are as follows:

1. A remedial design program would be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.

2. A soil cover would be constructed over all vegetated areas to prevent exposure to contaminated soils. The cover would consist of at least 12 inches of clean soil underlain by an indicator such as orange plastic snow fence to demarcate the cover soil from the subsurface soil. The top four inches of soil would be of sufficient quality to support vegetation. Clean soil would constitute soil with no analytes in exceedance of NYSDEC TAGM 4046 soil cleanup objectives as determined by the procedure in DER 10 ("Tech Guide"). Non-vegetated areas (buildings, roadways, parking lots, etc) would be covered by a paving system or concrete at least 6 inches in thickness.

3. Treatment of soil and groundwater in the area of Parcel 1 where the tank and drums were removed. Multi-phase extraction is proposed as the representative treatment technology. Groundwater and soil vapor would be pumped and treated prior to discharge to the sanitary sewer and atmosphere, respectively.

4. Excavation and off-site disposal of the portion of the petroleum pipelines that crosses Parcel 2 of the site. The remaining ends of the pipes would be capped at the site boundary.

5. Development of a site management plan to: (a) address residually contaminated soils and fill material that may be excavated from the site during future redevelopment. The plan would require soil characterization and, where applicable, disposal/reuse in accordance with NYSDEC regulations; (b) evaluate the potential for vapor intrusion for any buildings developed on the site; (c) identify any use restrictions; and (d) provide for the monitoring and maintenance of the components of the remedy.

6. Imposition of an institutional control in the form of an environmental easement that would: (a) require compliance with the approved site management plan; (b) limit the use and development of the property to commercial, industrial and passive recreational uses only; (c) restrict the use of groundwater as a source of potable water and other uses without necessary water quality treatment as determined by NYSDOH; and (d) require the property owner to complete and submit a certification to the NYSDEC on a periodic basis.

7. Periodic certification by the property owner, prepared and submitted by a professional engineer or such other expert acceptable to the NYSDEC, until the NYSDEC notifies the property owner in writing that this certification is no longer needed. This submittal would contain certification that the institutional controls and engineering controls, are still in place, allow the NYSDEC access to the site, and that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan.

8. The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the NYSDEC determines that continued operation is technically impracticable or not feasible.

9. Since the remedy results in untreated hazardous substances remaining at the site, a long term groundwater monitoring program would be instituted. This program would allow the effectiveness of the groundwater treatment to be monitored and would be a component of the operation, maintenance, and monitoring for the site.

TABLE 1A:
Nature and Extent of Contamination
PARCEL 1

SURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	ND (0.0056) - 3.0	0.224	6 of 16
	Chrysene	ND (0.012) - 3.4	0.40	6 of 16
	Benzo(b)fluoranthene	ND (0.021) - 4.7	1.1	3 of 16
	Benzo(K)fluoranthene	ND (0.013) - 2.8	1.1	3 of 16
	Benzo(a)pyrene	ND (0.0064) - 2.8	0.061	9 of 16
	Dibenz(a,h)anthracene	ND (0.011) - 0.11	0.014	5 of 16
Inorganic Compounds	Arsenic	4.42 - 37.5	7.5	12 of 16
	Barium	73.5 - 893	300	4 of 16
	Beryllium	0.264 - 5.49	0.16	16 of 16
	Cadmium	0.594 - 17.2	10	1 of 16
	Chromium	7.59 - 309	50	2 of 16
	Copper	7.78 - 1,020	25	11 of 16
	Iron	22,400 - 144,000	2,000	16 of 16
	Mercury	ND (0.006) - 3.6	0.10	3 of 16
	Nickel	5.17 - 124	13	11 of 16
	Selenium	0.998 - 6.11	2.0	13 of 16
	Zinc	43.2 - 5,290	20	16 of 16

SUBSURFACE SOIL AND FILL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	ND (0.005) - 1.4	0.224	13 of 53
	Chrysene	ND (0.011) - 1.2	0.40	6 of 53
	Benzo(b)fluoranthene	ND (0.019) - 1.2	1.1	1 of 53
	Benzo(a)pyrene	ND (0.006) - 1.1	0.061	22 of 53
	Dibenz(a,h)anthracene	ND (0.01) - 0.19	0.014	5 of 53
Inorganic	Arsenic	2.58 - 44.5	7.5	20 of 46

TABLE 1A:
Nature and Extent of Contamination
PARCEL 1

SUBSURFACE SOIL AND FILL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Compounds	Barium	20.1 - 350	300	2 of 46
	Beryllium	0.08 - 7.64	0.16	44 of 46
	Chromium	ND (0.112) - 106	50	1 of 46
	Copper	2.96 - 149	25	15 of 46
	Iron	6,010 - 169,000	2000	46 of 46
	Mercury	ND (0.006) - 0.366	0.10	11 of 46
	Nickel	1.44 - 136	13	29 of 46
	Selenium	0.337 - 12	2	20 of 46
	Zinc	9.38 - 949	20	45 of 46

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Acetone	ND (2.3) - 66	50	1 of 12
	Methyl t-butyl ether	ND (0.28) - 27	10	1 of 12
	Benzene	ND (0.24) - 17	1	4 of 12
	Toluene	ND (0.36) - 110	5	1 of 12
	Ethyl benzene	ND (0.41) - 110	5	2 of 12
	Xylenes (total)	ND (0.37) - 430	5	2 of 12
	Isopropyl benzene	ND (0.33) - 38	5	2 of 12
Semivolatile Organic Compounds (SVOCs)	Naphthalene	ND (0.27) - 83	10	1 of 12
	2-Methyl naphthalene	ND (0.5) - 16	N/A	
Inorganic Compounds	Cobalt	ND (2.38) - 5.4	5.0	1 of 8
	Iron	62.4 - 3,690	300	6 of 8
	Manganese	8.06 - 3,670	300	5 of 8
	Selenium	ND (5.2) - 13.9	10	3 of 8

[a] ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;

TABLE 1A:
Nature and Extent of Contamination
<u>PARCEL 1</u>

[b] SCG = standards, criteria, and guidance values; {list SCGs for each medium}

ND - Not detected at the concentration listed in parentheses
N/A - No groundwater standard or guidance value exists for 2-methyl naphthalene

TABLE 1B:
Nature and Extent of Contamination
PARCEL 2

SURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	1.3 - 11	0.224	4 of 4
	Chrysene	1.6 - 11	0.4	4 of 4
	Benzo(b)fluoranthene	1.1 - 14	1.1	3 of 4
	Benzo(k)fluoranthene	1.5 - 7.2	1.1	3 of 4
	Benzo(a)pyrene	1.0 - 8.8	0.061	4 of 4
	Dibenz(a,h)anthracene	ND (0.013) - 0.7	0.014	3 of 4
Inorganic Compounds	Arsenic	8.3 - 16.6	7.5	4 of 4
	Beryllium	0.36 - 0.79	0.16	4 of 4
	Copper	23.8 - 34.5	25	2 of 4
	Iron	11,300 - 32,300	2,000	4 of 4
	Mercury	ND (0.006) - 0.222	0.1	2 of 4
	Nickel	12.7 - 24.6	13	3 of 4
	Selenium	0.373 - 2.16	2	1 of 4
	Zinc	40.2 - 251	20	3 of 4

SUBSURFACE SOIL AND FILL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	ND (0.005) - 1.0	0.224	2 of 24
	Chrysene	ND (0.011) - 1.2	0.40	2 of 24
	Benzo(b)fluoranthene	ND (0.018) - 1.24	1.1	1 of 24
	Benzo(a)pyrene	ND (0.006) - 0.86	0.061	2 of 24
	Dibenz(a,h)anthracene	ND (0.01) - 0.21	0.014	1of 24
Inorganic	Arsenic	1.81 - 51	7.5	5 of 11
	Beryllium	0.214 - 2.89	0.16	11 of 11
	Cobalt	5.81 - 40.4	30	1 of 11

TABLE 1B:
Nature and Extent of Contamination
PARCEL 2

SUBSURFACE SOIL AND FILL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
	Copper	8.63 - 355	25	5 of 11
	Iron	16,300 - 375,000	2000	11 of 11
	Nickel	6.44 - 93.5	13	8 of 11
	Selenium	0.328 - 7.1	2	3 of 11
	Zinc	12.7 - 665	20	9 of 11

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Methylene chloride	ND (0.43) - 18	5	1 of 11
	Benzene	ND (0.24) - 23	1	2 of 11
	Ethyl Benzene	ND (0.41) - 15	5	1 of 11
	Isopropyl benzene	ND (0.33) - 6.6	5	1 of 11
Inorganic Compounds	Iron	86.1 - 21,700	300	3 of 4
	Manganese	734 - 6870	300	4 of 4

TABLE 1C:
Nature and Extent of Contamination
PARCEL 3

SURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	0.74	0.224	1 of 1
	Chrysene	0.78	0.4	1 of 1
	Benzo(b)fluoranthene	1.4	1.1	1 of 1
	Benzo(a)pyrene	0.83	0.061	1 of 1
Inorganic Compounds	Arsenic	14.6	7.5	1 of 1
	Beryllium	0.683	0.16	1 of 1
	Copper	44.4	25	1 of 1
	Iron	59,900	2,000	1 of 1
	Mercury	0.14	0.1	1 of 1
	Nickel	23.5	13	1 of 1
	Zinc	265	20	1 of 1

SUBSURFACE SOIL AND FILL	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a]	Frequency of Exceeding SCG
Inorganic Compounds	Arsenic	8.84	7.5	1 of 1
	Beryllium	1.07	0.16	1 of 1
	Copper	32.1	25	1 of 1
	Iron	31,200	2,000	1 of 1
	Nickel	21.7	13	1 of 1
	Selenium	2.26	2	1 of 1
	Zinc	81.6	20	1 of 1

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a]	Frequency of Exceeding SCG
Inorganic Compounds	Iron	1,480	300	1 of 1
	Manganese	2,560	300	1 of 1

Table 1
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual OM&M	Total Present Worth
Parcel 1			
No Action	$ 0	$ 5,750	$ 30,735
Institutional Controls	$ 5,000	$ 1,200	$ 23,000
Soil Cover and Institutional Controls	$ 1,940,000	$ 13,150	$ 2,084,000
Groundwater Remediation, Soil Cover and Institutional Controls	$ 2,154,000	$ 13,150	$ 2,298,000
Parcel 2			
No Action	$ 0	$ 0	$ 0
Institutional Controls	$ 5,000	$ 600	$ 14,000
Soil Cover and Institutional Controls	$ 325,000	$ 9,300	$ 422,000
Parcel 3			
No Action	$0	$0	$0
Institutional Controls	$ 5,000	$ 330	$ 10,000
Soil Cover and Institutional Controls	$ 48,000	$ 1,300	$ 68,000
Excavation	$ 601,000	$ 0	$ 601,000
Recommended Alternative			
Parcel 1 - Groundwater Remediation, Soil Cover and Institutional Controls Parcel 2 - Soil Cover and Institutional Controls Parcel 3 - Soil Cover and Institutional Controls	$ 2,527,000	$ 23,750	$ 2,788,000